Incentives for Utility-Scale Solar: Recommendations for Ohio based on a Benchmark Analysis

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SMART COLUMBUS

Table of Contents

Acronyms

CEJA	Clean Energy Jobs Act
CHOICE	Comprehensive Hoosier Option to Incentivize Cleaner Energy
ComEd	Commonwealth Edison
CPS	Clean Energy Portfolio Standard Program
DG	Distributed Generation
EEPS	Energy Efficiency Portfolio Standard
FEJA	Future Energy Jobs Act
HB6	House Bill 6
ICC	Illinois Commerce Commission
ILSFA	Illinois Solar for All Program
MISO	Midcontinent Independent System Operator
MIRECS	Michigan Renewable Energy Certification System
MW	Megawatt
NREL	National Renewable Energy Lab
NIPSCO	Northern Indiana Public Service Company
OPSB	Ohio Power Siting Board
PJM	Pennsylvania, Jersey, Maryland Power Pool
PV	Photovoltaic
RPS	Renewable Portfolio Standard
SB3	Senate Bill 3
SB52	Senate Bill 52
SDG	Sustainable Development Goal
SEF	Sustainable Energy Fund
SEIA	Solar Energy Industry Association
SES	Solar Energy Standard
TVA	Tennessee Valley Authority

Executive Summary

This project is a collaboration between Smart Columbus and the undergraduate Capstone Group from The Ohio State University's Environment, Economy, Development, and Sustainability (EEDS) major. Columbus, Ohio received a Smart City grant of $50 million in 2016 after winning the U.S. Department of Transportation's (USDOT) Smart City Challenge. This money funded Smart Columbus, an initiative that seeks to modernize cities via sustainable development to drive growth in the economy and improve people's quality of life. As the climate crisis continues to shape our world, a smooth transition to clean energy is necessary to combat environmental degradation and create jobs that support the economy. Central Ohio has the opportunity to invest in utility-scale solar projects to accelerate this transition and lead the nation in carbon emission reduction. However incentivizing this deployment remains a challenge.

Smart Columbus tasked the five person OSU team to conduct a "landscape assessment of best practice utility-scale solar incentive programs" and to recommend a program that could work in the State of Ohio. To achieve this, the team conducted interviews with professionals in the field and reviewed the literature to form a benchmark analysis of utility-scale solar projects in various Midwestern States. Our research assessment started with background on the electricity market, types of financial incentives, and requirements for utility-scale solar projects (USSP). Ohio was then benchmarked relative to other comparable US states (eg. similar geography, climate, and political environment). Next, each team member evaluated a specific Midwestern State to delve deeper into specific policies and programs for that region.

While our evaluations concluded that a strong Renewable Portfolio Standard (RPS) was essential, there were other incentive combinations that could benefit Ohio's solar deployment such as a green fund. States with and without RPS, utilized policies/programs that (1) provided financial incentives funded by the state or ratepayer and (2) involved community engagement. Although it is currently unlikely Ohio will pass laws that increase financial incentives or expand/target the RPS towards more utility scale solar, community engagement could lay the foundation for strong future incentive programs. Thus, we recommend a three-pronged approach with complementary pieces to bolster an incentive package. The first prong involves implementing traditional incentives of expanded RPS and a sustainable energy fund, the second involves job development, and the third community outreach. We believe that the policies/programs described herein will help inform Smart Columbus of the various incentives other states use so that Ohio policymakers can implement effective solar adoption strategies.

1.0 Introduction

1.1 Framing

The report provides Smart Columbus, interested policymakers, and the others with best-practices that can incentivize the adoption of utility-scale solar, specifically in Ohio. This task was commissioned by Smart Columbus (specifically Alex Slaymaker and Zach McGuire) to be completed by the aforementioned authors students taking the Environment, Economy, Development, and Sustainability (EEDS) Capstone Course in the Spring of 2021. This report represents the semester long body of work and cumulative knowledge (4+ years of study) of the team involved. The team was delighted to work with Smart Columbus on the acceleration of clean energy transition in Columbus and the State of Ohio. We believe that our research could help advance the implementation of utility-scale solar energy and create a sustainable infrastructure in Ohio.

The transition to renewable energy is of paramount concern because of the increasing threat that climate change and resource constraints pose to Ohio. (Please see as cited in the References section: The 2018 IPCC Summary for Policies Makers, The 2018 Columbus Climate Adaptation Plan, and The Forthcoming Columbus Climate Action Plan). Utility-scale solar is viewed as the most effective pathway to achieve CO_2 reductions in Ohio. Thus, this report seeks to develop incentive programs that demonstrate the economic and societal benefits of utility-scale solar while accounting for the geopolitical landscape in Ohio.

1.2 Background on Utility-Scale Solar

Utility-scale solar is the specific focus of this project. Utility-scale solar is defined in several different ways. The Solar Energy Industry Association (SEIA) defines utility-scale solar as a solar project that has 1 MW of production capacity, the National Renewable Energy Lab (NREL) defines it as 5 MW, and the Ohio Power Siting Board (OPSB) defines it as 50 MW. This report will define it in line with the OPSB, as a solar energy project that has 50 MW (or more) in production capacity. For perspective, a 50 MW solar operation would require more than 1 square mile of land. Regardless of its exact definition, utility scale solar is a term used to describe large solar projects that seek to utilize economies of scale to maximize efficiency and lower per Mw costs. These projects are often built to provide large facilities, companies, entities, or communities with renewable energy. In Ohio, specifically, these projects are being commissioned by counties/cities (Hardin, Vinton, Buford, Dayton, etc.), large corporations (Google, Microsoft, Amazon, etc.), and manufacturing companies. The solar market has been expanding rapidly in the United States over the past five years and Ohio installations are also growing rapidly. This growing market and the specifics is further discussed in the “Background” section that follows.

1.0 Introduction

1.3 Methods

This project implemented a benchmarking analysis in order to execute its goals. Specifically, we benchmarked incentives for utility-scale solar, and more generally renewable energy, in surrounding or similar states. The benchmark analysis used the following methods:

1. Interviews of important industry stakeholders (see Appendix A for list of interviewees and questions asked),
2. Review of peer-reviewed literature, and
3. Review of surrounding state and local government websites, programs, and policies

Research was focused on the Midwest, states similar to Ohio, and regions within the Pennsylvania, Jersey, Maryland (PJM) Interconnection grid, in order to be most applicable to Ohio's political, energy, and geographical landscape. Our research resulted in three sections of results:

1. Background of Energy in Ohio: a brief history of energy policy and development in Ohio,

2. Policies Analyzed: a benchmark analysis of policies from around midwestern states, and

3. Recommendations for Ohio: incentives for utility scale solar development in Ohio.

1 Background of Energy in Ohio

A brief history of energy policy and development in Ohio.

2 Policies Analyzed

A benchmark analysis of policies from around midwestern states,

3 Recommendations for Ohio

Incentivizes for utility scale solar development in Ohio.

2.0 Background of Energy In Ohio

2.1 Renewable Energy: The Fastest Growing Energy Market in the World

Renewable energy is becoming a more viable option for both the developing and developed world as environmental degradation increases, and nonrenewable energy sources deplete over time. The United Nations has set a Sustainable Development Goal (SDG) for the world to substantially increase its share of renewable energy sources by 2030 and other global/international organizations such as the EU have similar goals (United Nations; European Commission, 2021). At a national level, President Biden has pledged to transition the country to have net-zero emissions by 2050 and an increasing number of large energy-demanding companies are pledging to switch to renewables in central Ohio aligning themselves with this plan for a 100% clean energy economy (Burger, B. et al., 2020).

2.2 History of Ohio's Energy Market and Policies

Ohio has a large market for Solar already and some infrastructure is already in place with nearly two dozen solar farms in some form of development across the state. With the ability to sell the power back to the PJM Interconnection, Ohio has a strong incentive to transition to renewable energy sources such as solar. Overall market forces are pushing Ohio towards renewables, despite policies that are inhibiting it. In 2008, Ohio implemented a renewable portfolio standard (RPS) and an energy efficiency portfolio standard (EEPS). In 2019, the RPS target was lowered by the state legislature from 12.5% to 8.5% and the EEPS solar power requirement was eliminated. Photovoltaics (PV) are increasing as electricity from coal-fired power plants become less competitive with other power sources. Utility-scale solar is becoming a more cost-effective and technologically advanced energy solution.

Before 1999, Ohio’s electricity market was in a regulated state and was dominated by eight investor-owned utilities who powered 91% of the state (Direct Energy, 2021). The four biggest utilities—AEP Ohio, Dayton Power & Light, Duke Energy, and FirstEnergy—acted as vertically integrated monopolies which controlled the bulk of how Ohio’s energy was generated, transmitted, and distributed to residents and businesses.

Ohio has historically relied on coal for the vast majority of its energy generation. But in the past decade, coal generation declined as new efficient natural gas plants were built and displaced coal power plants. By 2019, natural gas generated more of Ohio’s in-state electricity than coal for the first time. In 2019, solar PV generation from utility-scale power facilities accounted for 0.15% of Ohio’s in-state electricity generation (U.S. EIA, 2020).

In July of 1999, Ohio’s Senate Bill 3 (SB3) restructured the state into a deregulated electricity market which allowed for retail competition (Direct Energy, 2021). Companies generating power could now sell it into a wholesale market, and competitive retail energy suppliers could purchase this electricity and sell it to customers. What did this mean for renewable energy development? In Ohio, deregulation from SB3 opened up the market to alternative energy suppliers—including solar energy developers—to join this competitive market.

2.0 Background of Energy In Ohio

2.3 Ohio's "Hotbed" for Solar Development

Deregulation offers consumers and companies a choice to source their energy from solar and this has turned into a “hotbed of solar development”. A natural market has emerged from corporations wanting clean, low cost, reliable, power, met in part by new utility-scale solar projects popping up all over Ohio that benefit from economies of scale. Two industry stakeholders in our interviews indicated that “Ohio is the hottest solar market in the country right now” and “surprisingly, Ohio’s solar market is growing faster than California’s or Arizona’s” (Interview 1, 2021; Interview 2, 2021).

The Ohio Power Siting Board (OPSB) is the regulatory body which oversees the siting process and must approve any utility-scale energy generation projects in the state before they are constructed. OPSB defines “utility-scale” solar as projects with a total generating capacity at or greater than 50 MW (Ohio Power Siting Board, 2021). The first utility-scale solar project in Ohio which became operational in 2018 was Hardin Solar Energy Center, located in Hardin County, Ohio and developed by Invenergy (Invenergy, 2021). Since then, OPSB has received hundreds of proposals for new utility-scale solar projects all over Ohio, with the largest project under construction now generating 200 MW and located in Brown County, Ohio (Ohio Power Siting Board, 2021). Since 2008, Ohio’s solar capacity has increased by more than 59,600%--having grown from 0.4 MW of installed grid-connected PV capacity in 2008 to now 238.8 MW installed capacity in 2020 (Ohio Power Siting Board, 2021).

2.4 Political Obstacles to Solar Growth

The attractiveness of Ohio’s market, alone, may not be enough to match the renewable energy growth in neighboring states. Implementation of more state-wide policies will be necessary to become one of the leaders in the Midwest. However, the composition of Ohio’s state legislature--in which both the state house and senate are currently Republican-controlled--makes it harder to pass more ambitious clean energy legislation. In addition, Ohio’s RPS is among the lowest of all the Midwestern states that have a mandatory target and has recently been reduced. Ohio’s original goal to source 12.5% of the state’s electricity retail sales from renewable energy by 2026 was reduced in 2019 to 8.5% by House Bill 6 (HB6). A RPS has been proven to be one of the most effective strategies to incentivize utility-scale solar in other states, so the fact that Ohio actually reduced its target is concerning for future solar development. Industry stakeholders in conducted interviews aptly indicated that “more barriers than incentives currently exist” for utility-scale solar (Interview 3, 2021). Further, almost all stakeholder interviews mentioned the complexity that Ohio’s political landscape adds to developing new solar projects.

2.0 Background of Energy In Ohio

2.5 Future of Utility-Scale Solar in Ohio

Ohio's utility-scale solar market is in the early stages of emerging as a key player in Ohio's energy future: the future is bright. However, growth in solar is expected to be robust. Prices have fallen 45% over the last 5 years for solar in Ohio and total solar investment is over $950 million (SEIA, 2021). Ohio's solar market is projected to grow 2,349 MW over the next 5 years which ranks as 12th in the country for anticipated growth (SEIA, 2021). Utility scale solar should continue growing rapidly in the state, as long as the incentives and policies exist to support it.

Senate Bill 52 was recently introduced in Ohio legislature in 2021 and if passed, would have deleterious effects on the growth of utility-scale solar development in Ohio. The legislation attempts to grant electors of a neighboring township to a solar project the right to petition for a referendum on the permit or amendment (SB 52, 2021). Essentially, this means that when a solar project is in the early stages of development, a neighboring township could have the power to terminate a project based on the majority of electors' votes. Proposed anti-solar legislation such as SB52 is a political barrier in Ohio that solar has to overcome as it continues to grow.

3.0 Policies Analyzed

We conducted a benchmarking analysis of incentives used in other U.S. states. For comparability only states close to Ohio, in the Midwest region, or within PJM were chosen for analysis. The states analyzed include: Michigan, Pennsylvania, Illinois, Indiana, Minnesota, and Tennessee (as shown below in Table 1). Importantly, all states are different, thus considerations of replicability and relevance are important in this study. Thus, policies that work in Pennsylvania and Illinois, may not work in Ohio. This was indicated and emphasized in all of our interviews (Interviews 1-7, 2021). These factors are further discussed in the subsequent "Recommendations for Ohio" section. In an effort to be comparable with Ohio, the previous section: "Background of Energy in Ohio," and factors in Table 1: legislation passed in, whether it has a deregulated market, and funding mechanisms, are collaboratively considered. Upon benchmarking it was clear that there were only a few incentives specific to utility-scale solar, thus many policies discussed here are general to renewable energy. Each state definition of "renewable energy", is shown in Appendix B. The proceeding section: "Breakdown of Policies," considers the policies listed in *Table 1* in detail.

3.1 Benchmark Analysis Results

3.1.2 Table 1: Benchmark Analysis of Surrounding State's Policies and Programs

State	Policy/Program and Year Enacted	Scope	Deregulated Energy Market (Y/N)	Legislation Passed In	Funding Mechanism
Michigan	P.A. 295 MIRECS (2008)	Statewide	Y	Republican	APX; state of Michigan
Pennsylvania	SEF (1998)	*Statewide funding for public energy and sustainability projects*	Y	Republican General Assembly, Democratic Governor	Electricity Sales
Illinois	SB 2814: FEJA (2016)	Statewide Program	Y	Democratic House Majority, Signed by Republican Governor	State funded, $2 million, and through SRECs
Indiana	NIPSCO CHOICE (2011)	Regional Program	N	Republican	State Funded
Minnesota	SES Legislation (2013)	Requires all energy utilities to obtain 1.5% of power from solar	N	Republican	N/A
Tennesee	Green Invest Program (TVA) (1933)	Regional incentive program investing in utility-scale solar	N	Republican	Receives revenue through electricity sales

3.0 Policies Analyzed

3.2 State Policies

3.2.1 Michigan: Michigan Renewable Energy Certification System (MIRECS)

Michigan has a deregulated energy market with a mandatory Renewable Portfolio Standard (RPS), also known as P.A. 295, of 15%. It applies to all electric providers within the state of Michigan including municipal, investor-owned, and cooperative utilities and alternative electric suppliers (State of Michigan, 2021). The types of renewable energy covered by the RPS include solar panels, wind turbines, biomass, waste-to-energy and hydroelectric. The system of execution for the RPS is called the Michigan Renewable Energy Certification System (MIRECS). There are currently 69 electric providers partaking in MIRECS which include municipal utilities, alternative electric suppliers, cooperative utilities, and rate-regulated utilities (Scripps et al., 2021). MIRECS utilizes renewable energy credits (RECs) which equals one megawatt-hour of renewable energy per REC (State of Michigan, 2021).

The MIRECS is used to track and certify RECs, incentive credits and energy waste reduction credits from participating utilities and electric providers. At the end of each year, materiality of electric providers is recorded in an annual compliance folder and then submitted to the Michigan Public Service Commission (MPSC) for review. According to the 2019 annual report, only 1% of RECs were attributed to solar, while most RECs came from wind (52%), biomass (13%), hydroelectric (12%), landfill gas (9%), and incentive credits (7%). MIRECS system has succeeded in Michigan in tandem with other major programs. This includes the Voluntary Green Pricing Programs which allow electricity customers the ability to match up to 100% of their electric usage with renewable energy from electric providers who are approved by the MPSC. One of these programs is DTE's MIGreenPower program. This program has a 50 MW solar project in the Lapeer and O'Shea areas of Michigan. DTE is Michigan's leading provider of and investor in solar energy, projected to provide 2,400 MW of renewable energy generation capacity by 2022 (DTE Energy, 2021). The project has been successful with Lapeer Solar Park providing energy required to fuel 11,000 homes, and with O'Shea Solar incorporating solar panels with community engagement and environmental stewardship.

MIRECS
Michigan Renewable Energy Certification System

3.0 Policies Analyzed

3.2.2 Illinois: Future Energy Jobs Act (FEJA)

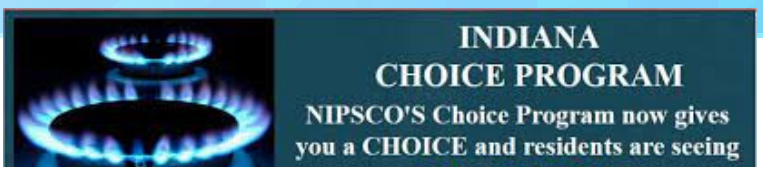
Although Illinois is the largest nuclear power generator and has a substantial amount of coal and natural gas generation, the state has also been shifting rapidly to renewables, particularly wind and solar. Illinois' deregulated electricity market implemented a Standard Renewable Portfolio Standard (RPS) in 2007, which helps drive their various renewable programs. Currently, their RPS is set at 25% by 2025-2026 and includes solar, wind, biomass, geothermal, and certain hydroelectric facilities. This higher target was developed in 2016 after significant legislation passed, under a Democrat House majority and a Republican Governor, Bruce Rauner (Future Energy, 2017). This legislation included The Future Energy Jobs Act (FEJA) to further the RPS and strengthen the economy through stimulating job creation and renewable investments. Illinois seeks to establish the state as a clean energy leader while preserving their low energy rates for consumers (Future Energy Jobs Act [FEJA] n.d.). The state provides $200 million annually for renewable sources and uses SRECs (Solar Renewable Energy Certificates) that solar developers could apply for under the Adjustable Block Program or ABP (Illinois Power Agency [IPA], 2019). The ABP's goal was to contract 1 million credits by 2021 for 666 MW of new solar generation. The price for the RECS was set by the ABP depending on if the project was a small direct generation (DG), large DG, or community solar project (IPA, 2019).

The Future Energy Jobs Act took effect on 1. June. 2017 and worked on three levels: energy efficiency, renewable energy, and job training/payments (Citizens Utility Board [CUB], 2018). Under the renewable energy measures, Illinois worked to fix their renewable energy laws and catalyzed investment in wind/solar power. They also worked with neighborhoods to create community solar programs and attach solar panels on residential roofs (CUB, 2018). Under job training and payment measures, upgraded the on-bill financing to help customers pay the efficiency enhancements and the state gave $750 million to training programs in renewable energy jobs, which decreases utility bills for customers.

Three job-training programs were created under ComEd as directed by the Illinois Commerce Commission (ICC). These programs include the Solar Training Pipeline Program, the Craft Apprenticeship Program, and the Multi-Cultural Job Training Program (CUB, 2020). The Solar Training Pipeline Program works in conjunction with the Illinois Solar for All Program (ILSFA), to help those "traditionally left out of the solar market" (Lydersen, 2021). It estimated that over 100,000 people are employed in clean energy jobs in Illinois, with 66% in energy efficiency and 20% in renewable energy as of 2019. (Illinois Environmental Council [IEC], 2020).

With the success of FEJA, these numbers are expected to continue to rise. In fact, FEJA was so successful that the state underestimated how many new developers would apply for SRECs and funding was tight in 2019. To address this issue, Illinois is introducing two bills, the Clean Energy Jobs Act or CEJA (HB 804) and the Path to 100 (HB 2640). Both have passed the Illinois House Energy and Environment Committee on 15. March. 2021 (Illinois Clean Jobs Coalition, 2021). The Clean Energy Jobs Act is an expansion of FEJA and increases energy efficiency standards with the expectation of quadrupling wind and solar power projections of FEJA. The Path to 100 bill seeks to provide funding by increasing the capped customer price per kilowatt-hour from 2007's rate of 2% to 4% by 2023 (Lydersen, 2021). Both bills make up for FEJA's financial shortcomings and expand the 25% RPS by 2025 to 40% by 2030. Although successful in Illinois, FEJA's replicability in Ohio is still limited because of its current political atmosphere and Ohio's lack of a more aggressive RPS. FEJA was built off after years of negotiations among energy companies, consumer advocates, and environmental groups, which Ohio is still in the process of organizing.

3.0 Policies Analyzed



3.2.3 Indiana: CHOICE

Indiana has relied predominantly on incentives in implementing solar energy with its residents. Indiana has a Voluntary Clean Energy Portfolio Standard Program (CPS) which is known as the Comprehensive Hoosier Option to Incentivize Cleaner Energy, or CHOICE (Solar Nation, n.d.).This program focuses on incentivizing the transfer from nonrenewable energy to photovoltaics. The rule which was passed in 2011, and issued effective in 2012, gives utilities the ability to gain financial assets when they meet certain clean energy targets (State of Indiana, 2021). The CHOICE program's aim is to get 10% of the electricity from renewable sources by 2025, but it is ***voluntary*** for local utilities. The goal of 10% renewable energy is measured by using the amount of electricity supplied by each given utility in 2010 as a baseline. In order to participate in Indiana's CPS, utilities are required to meet three incremental goals which keep the utilities on track and allow them to receive financial incentives. The three goals include:

1. Supply an average of at least 4% of electricity from renewable energy between January 1, 2013 and December 31, 2018
2. Supply an average of at least 7% of electricity from renewable energy between January 1, 2019 - December 31, 2024
3. Supply an average of at least 10% of electricity from renewable energy between January 1, 2025 - December 31, 2025

In addition to their voluntary nature, there is some flexibility for these goals for each participating utility. One rule of the CPS is that utilities may buy, sell or trade 1 Clean Energy Credit which equates to 1 MWh of renewable energy in the state of Indiana (Clean Energy Authority, 2018). Indiana utilities participating in the CPS must purchase at least 50% of their eligible energy within Indiana to comply. Up to 30% of the goal may be met with "clean coal" technology; nuclear energy; combined heat and power systems; natural gas that displaces electricity from coal; clean coal technology; and net-metered distributed generation facilities. Thermal energy used for heating, cooling, or mechanical work is eligible for the goal. Clean coal technology, nuclear energy, combined heat and power systems, natural gas that displaces electricity from coal, clean coal technology, and net-metered distributed generation facilities are all sources of energy that are considered in compliance with the goals as long as they contribute 30% or less to the target. As of 2020, Indiana ranked 24th nationally in terms of the amount of installed solar power. For reference Ohio ranks just ahead at 23rd (SEIA, 2021).

3.0 Policies Analyzed

3.2.4 Pennsylvania: RPS and Sustainable Energy Fund (SEF)

As our literature review suggests, RPSs, coupled with cash incentives, are the most effective way to incentivize renewable energy on the state level (Sarzynski, Larrieu, & Shrimali, 2012; Easton, 2014). Pennsylvania identified this strategy in their "Pennsylvania Solar Future Plan" (Pennsylvania Department of Environmental Protection, 2018). As a result Pennsylvania has a RPS and a "Sustainable Energy Fund," which are both discussed in the paragraphs below. The figure in Appendix C shows Pennsylvania's success in the utility-scale solar market, which has substantially increased in the past year, largely due to the incentives discussed below.

Pennsylvania passed the "Alternative Energy Portfolio Standard Act" (their version of a RPS) in 2004; this mandated, generally, that all Pennsylvanian utilities "supply 18% of its electricity using alternative-energy resources by 2021" (PPUC, 2021). Of note is that the majority of this standard is met by Tier 2 technology (10%) which are not renewables, while the requirement for conventional renewables (wind, solar, geothermal, biomass and low impact hydro) is only 8%. Nonetheless, the program has been successful in promoting renewables in Pennsylvania, and, obviously, ends at the end of this year (2021). A short term deadline (e.g. 2021) has incentivized significant utility-scale solar development in the past. It is expected that Pennsylvania will be working on updating their RPS with more aggressive standards for the coming decades.

More uniquely, Pennsylvania has a "Sustainable Energy Fund" that was passed in 1998 by the then majority Republican Pennsylvania General Assembly. This resulted from the Pennsylvania Public Utility Commission in the 1998 utility restructuring, which also created four new regulated distribution utilities, deregulated retail energy in the state, and developed the fund discussed here, along with other programs (Electric Choice, 2021). Though it is one program, each of the four utilities were required to fund a subset of the fund. The utilities fund this through a customer bill charge. Customers can then apply for grants from this fund. The funds are managed by the Pennsylvania Economic Development Association (PEDA) and they provide loans/grants to "governmental organizations and nonprofits eligible for tax-exempt financing: municipalities, counties, school districts, non-profits, non-profit hospitals, public universities, private schools and universities, and water authorities" seeking to develop large-scale ($2 million+) alternative energy projects (Sustainable Energy Fund, 2021). This allows the entities discussed above to receive low-interest loans in the form of state bonds or grants to build their own energy projects. This has resulted in small-scale and large-scale development of renewable energy projects, energy-saving projects, and equity projects. Solar has been a part of this development, but not the main outcome or goal of the Sustainable Energy Funds.

Sustainable Energy Fund

3.0 Policies Analyzed

3.2.5 Minnesota: Solar Energy Standard (SES) Legislation

Out of the eight Midwestern states which we have analyzed in this report, Minnesota has the highest RPS, which requires that the state's utilities, with the exception of the largest one, obtain an impressive 26.5% of their energy from renewable sources. And the largest electric utility in the state--Xcel Energy--has to obtain 31.5% of its energy from renewable sources (U.S. EIA, 2020). However, most of this renewable energy is not solar, but instead, wind power. Minnesota is among the top 10 states in the nation in installed generating capacity and net generation from wind due to its high average wind speeds owing to its broad southern prairie topography (U.S. EIA, 2020).

While there are many incentives for wind generation in the state due to abundant natural resources, Minnesota is not as rich in solar resources due to its northern geographic location and lack of sunlight in areas. Due to this lack of solar resources, Minnesota has not heavily invested in utility-scale solar projects, but they have encouraged smaller-scale (residential and commercial) solar incentives. There are abundant financial incentives for residential and commercial solar installers such as sales tax exemptions, net metering, annual energy production payments per kilowatt-hour (kWh), and a lottery-based rebate program (Minnesota House of Representatives, 2013).

One of the most significant incentives Minnesota has used to advance utility-scale solar generation in their state was a statute in state legislation passed in 2013. Minnesota's Republican-controlled Legislature in 2013 adopted Statute section 216B.1691, subd. 2f which established a Solar Energy Standard (SES) in the state of Minnesota. This Solar Energy Standard required all public utilities in the state to acquire 1.5% of all retail electricity sales from solar energy by 2020, with a goal of obtaining 10% of Minnesota retail sales from solar energy by 2030 (Minnesota Department of Commerce, 2013). Three companies are subject to the SES: Minnesota Power, Ottertail Power Company, and Xcel Energy. Since the legislation was enacted in 2013, Minnesota's solar capacity has increased by more than 9000%--having grown from 17 MW of grid-connected PV capacity in 2013 to 1,568 MW in 2020 (Minnesota Department of Commerce, 2018).

The reason why this Solar Energy Standard legislation was successful in Minnesota was in part, how well it worked within the structure of their regulated energy market. Minnesota's electricity market is consolidated into three companies which act as vertically integrated monopolies in the market. This means that the companies own and operate all of their electricity (from generation to transmission to selling electricity to customers). Since they are traditional cost-of-service utilities, they are allowed to pass through the costs of meeting a mandatory solar energy standard directly to customers, Thus, compliance was never an issue. In addition, legislators and regulators could collaborate on the law to ensure it was in the public interest.

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3.0 Policies Analyzed

3.2.6 Tennessee: TVA and Green Invest Program

In Tennessee, the program that is driving utility-scale solar development is the Tennessee Valley Authority's Green Invest program. The Tennessee Valley Authority (TVA) is a federal public power corporation that works in conjunction with six surrounding states to provide over 10 million with electricity (Tennessee Valley Authority, 2018). Although the TVA is a federal cooperation, it is not taxpayer funded, rather it receives its funds from electricity sales. In 2018, the TVA came up with the Green Invest Program, intended to invest in solar projects through long term power purchasing agreements of public and private firms. The TVA modeled the Green Invest Program after working with companies like Google and Facebook to better identify and invest in energy solutions in the Valley area (Fiedler, 2020).

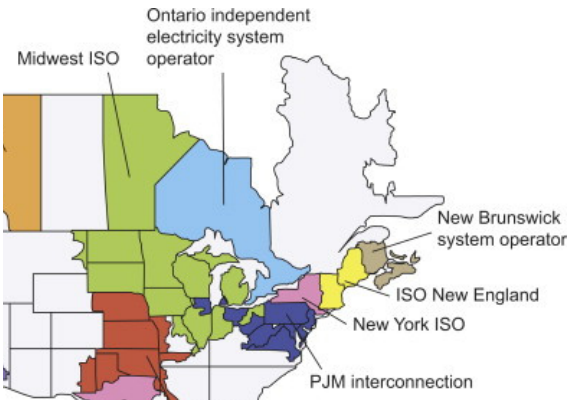
The Green Invest Program is structured to bring in voluntary public and private companies to be partnered together in long term agreements through a competitive auction bidding process. Once these contracts are made, the TVA works alongside these partnerships to invest in large-scale solar installations (Silicon Ranch, 2020). Since 2018, the Green Invest program has generated nearly $1.4 billion in economic activity as well as providing an electricity supply that is both competitive and over 60% produced from carbon-free sources (Fiedler, 2020). Large projects in Tennessee are being taken on through partnerships like the Metro Government, Nashville Electric Service, and Vanderbilt University looking to build 125 Megawatts of utility-scale solar. On behalf of this partnership, the TVA contracting with Silicon Ranch intends to construct a 125 Megawatt project that will help to achieve sustainability goals and create large amounts of savings in the Metro community over the 20 year agreement (Bates, 2020). Google and Origis Energy are also using Green Invest to facilitate companies to become completely carbon free by the year 2030. With TVA's investment, Origis Energy plans to construct a solar farm that will create hundreds of jobs and contribute to increased savings (Origis Energy, 2020).

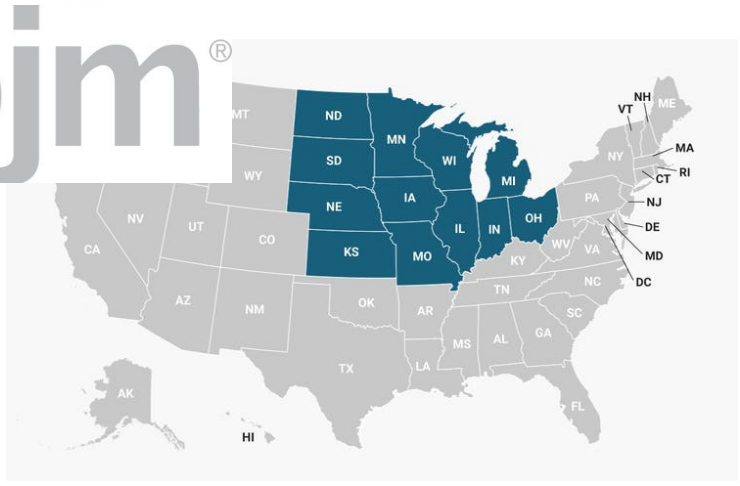
The Green Invest Program has successfully incentivized utility-scale solar projects in Tennessee. This is in spite of the fact that there is no RPS, low electricity rates and relatively little political support for solar in the state.

4.0 Recommendations for Ohio

Based on our review of the above-mentioned Midwestern states and policies, we recommend a series of policies that could be applicable for Ohio. Our assessment of the applicability of *each* policy analyzed above in Ohio's political and energy landscape is discussed in Section 4.1 and shown in *Table 2*. Critically, as we discussed in the Background section, Ohio's political environment is particularly problematic with regards to expanding renewable energy development. Thus, the applicability of other state policies must be viewed through Ohio's politics as well as its current energy market, the deregulated retail electricity market in Ohio, Ohio's demographics, and Ohio's geography.

Section 4.2 suggests policy pathways forward to encourage utility-scale solar development in Ohio. This analysis builds upon all previous knowledge discussed in this report and provides policy-makers and decision-makers applicable, implementable, and effective programs / policies to incentivize utility-scale solar development in Ohio.





4.0 Recommendations for Ohio

4.1 Applicability of the Aforementioned Policies in Ohio

4.1.1 Table 2: Applicability of Previously Outlined Solar Policies and Programs

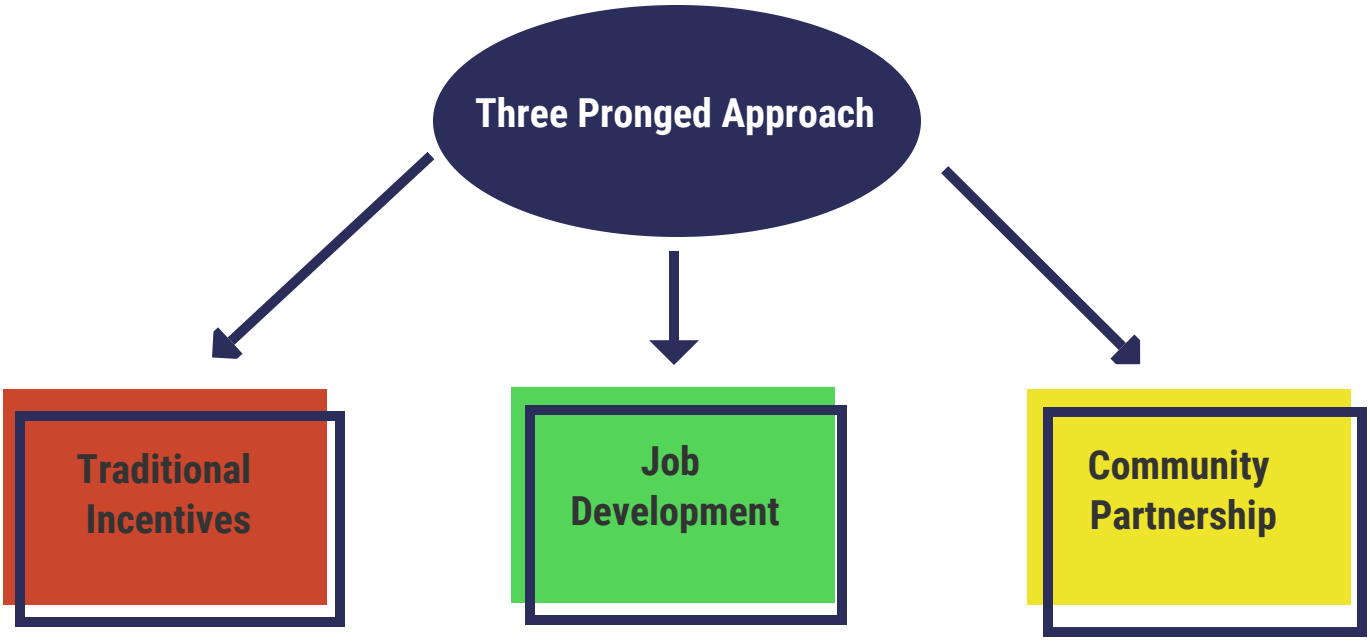
State	Policy Passed	Ohio Applicable (Y/N)	Success and Discussion
Michigan	Michigan Renewable Energy Certification System (MIRECS) (2008)	Y	-Due to passing in a republican General Assembly -Funding mechanism is largely implementable -Largely successful, but not specific enough for utility-scale solar. Thus, there would need to be substantial changes.
Pennsylvania	Sustainable Energy Fund (2000)	Y	-As of January 2017, more than 10 million RECs were issued -Although PA's Tier 1 (renewables) target in 2021 (8%) is only slightly more rigorous than Ohio's current targets, P.A. 295's structure and renewable energy requirement is a reasonable RPS for Ohio to replicate and achieve by 2030 -There is no particular emphasis on solar, and wind has been the most utilized renewable in PA, thus, some assessing would need to be done to understand how to implement it in Ohio with incentives primarily around solar
Illinois	Future Energy Jobs Act (FEJA) (2016)	Y/N	-Prior legislation provided a foundation for FEJA to be implemented, which Ohio lacks, specifically an RPS. -Has support of Governor and General Assembly -FEJA successful, but implementation still being worked to stay on track. Should be looked at as a Beta test at the moment. - If Ohio's General Assembly sets a new RPS and decides to officially tackle climate change through a dedication to renewable energy, then the FEJA program is an excellent option to consider.
Indiana	Comprehensive Hoosier Option to Incentive Cleaner Energy (CHOICE) (2011)	Y	-Due to its voluntary nature, a program like CHOICE could be effectively implemented in Ohio, due to its non-mandatory, incentive-based structure.
Minnesota	Solar Energy Standard (SES) Legislation (2013)	N	-Largely successful in Minnesota because of its renewable friendly political climate, regulated electricity market, & oversight of public utilities, which Ohio does not have -Could be implemented with a distribution charge on regulated utilities in Ohio, though this would require legislation which is unlikely at this time.
Tennesee	Green Invest Program (TVA) (2018)	Y	-TVA acts as a potentially replicable third party because the program is funded through electricity sales, not taxpayer funds -Program is successful in a majority red state with no RPS

4.0 Recommendations for Ohio

4.2 Final Policy Recommendation for Ohio

We recommend the following three pronged approach: 1. Traditional Incentives, 2. Job Development Program, and 3. Community Partnership. In light of the current "hot" market for solar in Ohio, our recommendation is designed to allow the current rapid trend beyond the next few years. Our three part recommendation for Ohio ensures that utility-scale solar development is incentivized in a cost-effective and efficient manner, but also in a manner that considers long term success and equity as equally important outcomes. One "prong" alone would not result in an effective, efficient, equitable, and long-term successful policy/project. Thus, it is suggested that policy makers and interested sub-groups consider this proposal as one final strategy with three encompassing parts. Below represents this recommendation in its theoretical infancy, as this project hopes that further research, feedback, discussion, and implementation contributes to its final form

4.2.1 Three Pronged Approach



4.0 Recommendations for Ohio

4.2.1.1 Traditional Incentives

First, it is important that traditional incentives are implemented in Ohio. Ohio has a complex relationship with RPSs and traditional incentives for renewable energy. However, if they can be passed into law, these incentives are powerful tools for Ohio to utilize. This report recommends two traditional incentives: RPS and an Energy Fund.

The literature suggests that RPS is the most effective way to incentivize renewable energy (Sarzynski, Larrieu, & Shrimali, 2012; Easton, 2014). Further, all interviewees indicated that RPS is the most effective way to incentivize renewable energy and that Ohio's actions regarding RPS represents a large obstacle for renewable energy in the state (Interviews 1-7, 2021). As previously discussed, Ohio's market for solar is growing rapidly, though the concern is that without a more ambitious RPS and other incentives this growth may slow considerably in the future. Expanded RPSs have succeeded in surrounding states: Pennsylvania, Michigan, Illinois, Minnesota, and most U.S. states, and could succeed in Ohio. The General Assembly has passed a RPS in Ohio and we foresee it being possible to strengthen it in the future. Though politically polarizing and contentious, the research on RPS is clear and thus a push to bolster it in Ohio should be considered as a primary part of this strategy.

Creating an energy fund that emulates characteristics of Pennsylvania or Indiana's should also be considered. In HB6 a similar fund was created to subsidize several coal plants and a nuclear plant, thus this fund could be implemented in a similar fashion. The literature and case studies show that cash incentives (in the form of grants, low-interest loans, etc.) are the second most powerful tool to incentivize renewable energy development (especially when coupled with RPS). Specifically, this fund could emulate Pennsylvania or Tennessee's programs by developing a fund that provides loans/grants to clean energy projects. These funds are often mandated by State Policy or the Utility Commissions to be funded by state distribution utilities through a relatively small charge to customers. These clean energy funds can be powerful tools in providing capital for large-scale renewable energy projects for public entities. Specifically, Ohio could offer low-interest loans (in the form of state bonds) to public entities looking to develop solar projects. Many big cities (Cleveland, Akron, Youngstown, Toledo, Columbus, Cincinnati, etc) would be interested in these low interest loans to begin bolstering their city's renewable energy usage. Indiana's CHOICE program would also be applicable to Ohio. This would be a fund that utilities could access if they meet certain clean energy targets. Importantly, this would incentivize, not force, utilities in Ohio to transfer to clean energy. Specifically, as interviews and research uncovered, Ohio utilities are largely not the entities increasing renewable energy generation, thus this would be an effective strategy to begin utility's transition.

4.0 Recommendations for Ohio

4.2.1.2 Job Development Program

The current market is already producing jobs and economic development due to high demand and the deregulated market in Ohio. However, almost of our the interviews and especially those with solar energy companies indicated that the job force in Ohio is largely insufficient to supply the current demand of utility-scale solar construction (Interviews 1-7, 2021). This has caused solar projects to be delayed and some have even moved development into different states as a result. An educated, experienced, and employable workforce is paramount to incentivizing solar companies to efficiently develop projects in Ohio (Michaud et al., 2020). This is especially tantamount given the policy that solar projects can receive status of a "Qualified Energy Project," which means they receive a complete "tax exemption" if they employ at least 80% Ohioans (Michaud et al., 2020; ODSA, 2021). Further, all interviews indicated that jobs and economic development would be critical pieces for a renewable energy policy to gain bi-partisan and wide-spread support in Ohio (Interviews 1-7, 2021).

Thus, we recommends A FEJA-like policy- developing more university and vocational school programs centered around solar installation, maintenance, and development. FEJA was indicated as not likely applicable to Ohio, though a similar state-wide program that seeks to educate a workforce for energy-related jobs could have potential in Ohio. Collaborations with public universities and local trade schools should exist; state funding could be flooded into bolstering these programs, providing scholarships/grants for interested students, and developing marketing to encourage enrollment.

4.2.1.3 Community Partnership

Fostering community involvement and partnerships is an important aspect in incentivizing utility-scale solar projects. With an integration of community involvement and participation development can effectively be brought into communities. Further, it is clear that when community participation strategies are implemented then the outcome is a long-term success for the community and the company. Vinton County, Ohio is an excellent example of community involvement facilitating successful solar projects. Through careful collaboration between Invenery, a Chicago-based energy company, and the Community of Vinton County, the partnership developed a 125 MW solar farm in a historically coal-dominated county (Dawes, 2020). Invenergy largely praises the partnership and collaboration with Vinton as the leading reason for the project's success. This is an example of how solar energy can provide revenue and jobs to a historically marginalized region. This model could be scaled up and emulated by other solar developers and projects. The TVA, as previously mentioned, is another good example of encouraging community involvement with community partnerships such as Vanderbilt University, Nashville Electric Service and the Metro government to provide clean energy to the entire Vanderbilt campus. Smart Columbus, or other entities, could emulate TVA in Ohio by being the intermediary to facilitate community partnership throughout the state. Further, policy could be enacted that requires solar companies to carefully partner and collaborate with communities where they plan their projects. This would ensure that community's doubts on solar are properly addressed, benefits are maximized, and potential negatives are mitigated.

It is also useful to mention the potential intertwining between recommendations such as facilitating community partnerships through incentives like Job Development programs. This kind of technique can be especially useful in specific communities with high levels of unemployment. With education programs and an employable workforce, both energy companies and eager communities will be more willing to partner in creating more utility-scale solar opportunities.

5.0 Conclusion

This report utilizes a benchmark analysis to develop possible incentives for utility-scale solar development in Ohio. The hope is that Smart Columbus, decision makers, and other Ohio entities can learn from this report to lobby for policies or implement programs that will incentivize utility-scale solar development. We found that a market for utility-scale solar already exists in Ohio and is functioning at a high level. However, renewable energy development and state policy is still contentious in Ohio.

Policies and programs from Michigan, Illinois, Indiana, Pennsylvania, Minnesota, and Tennessee were analyzed in depth. It was concluded that aspects of Indiana's CHOICE, Pennsylvania's SEF, Tennessee's Green Invest, and Illinois' FEJA are replicable programs in Ohio's unique geopolitical landscape. As these programs were crafted for the specific states in which they operate, the same would need to be done for a program that wishes to succeed in Ohio.

The "Three Pronged Approach" was proposed as a recommendation for how Ohio, specifically, can incentivize utility-scale solar development. First, traditional incentives like an RPS and a sustainable energy fund should be considered due to their proven effectiveness. Second, job development that creates and provides funding for programs that train an industry workforce is critical, as the workforce is currently insufficient. Thirdly, community partnership should be implemented in an effort to ensure the long term success of these solar projects for the companies, communities, and the state.

This report presents the potential for utility-scale solar incentives in Ohio. Due to the utilization of a benchmark analysis, this report did not consider incentives implemented in other states. Incentives in other states (NY, CA, OR, WA, TX, etc.) and more theoretical ones (Carbon Tax, Carbon Trading, etc.) suggested by the literature are worth considering in Ohio. Nonetheless we are confident in our recommendation of a Three Pronged Approach in Ohio. Also, this report did not fully expand on the Three Pronged Approach and how it can be implemented in Ohio. Thus, further research will be needed to fully understand the specifications for each incentive and how they could be implemented in Ohio. We remain optimistic for continued rapid solar development in Ohio *mainly* due to Ohio's current robust market for solar, the compelling research on the benefits of renewable energy, and the Three Pronged Approach recommended in this report.

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Interview References

Interview #1 (2021, Feb. 2nd). Group zoom interview with Dr. Gilbert Michaud.

Interview #2 (2021, Feb,. 5th). Group zoom interview with Andrew Rudersdorf.

Interview #3 (2021, Feb. 7th). Group zoom interview with Randi Leppla.

Interview #4 (2021, Feb. 9th). Group zoom interview with Daniel Smies.

Interview #5 (2021, Feb. 17th). Group zoom interview with Scott Perry.

Interview #6 (2021, Feb. 19th). Group zoom interview with Dan Sawmiller.

Interview #7 (2021, March 2nd). Group zoom interview with Dylan Borcher.

Appendix A: Interviewees and Questions Asked

Interviewees:

1. Randi Leppla - Vice President of Energy Policy & Lead Energy Counsel for the Ohio Environmental Council
2. Dr. Gilbert Michaud - Assistant Professor of Practice at Ohio University
3. Andrew Rudersdorf -Director of Origination for Invenergy
4. Scott Perry - Director of Operations at SWACO
5. Dylan Borcher - Law Associate at Bricker & Eckler
6. Daniel Smies -Director of Business Development Strategy for AEP Onsite Partners; knowledgeable of solar
7. Dan Sawmiller - Energy Policy for NRDC

Generic List of Questions Asked to All Interviewees:

1. Can you give a brief overview of the preexisting policy incentives which exist in Ohio to advance utility-scale solar?
2. Can you compare Ohio to another Midwest state in terms of who is the benchmark standard in advancing utility-scale solar? What methods are states using to incentivize solar?
3. What are the largest obstacles to developing solar in Ohio?
4. If you were in charge of advancing utility-scale solar in the state of Ohio, which methods would you employ? Who are the major stakeholders you would reach out to?
5. Which incentives would you think are the most useful to decarbonizing Ohio and developing more solar? What incentives does Ohio NEED to advance solar?

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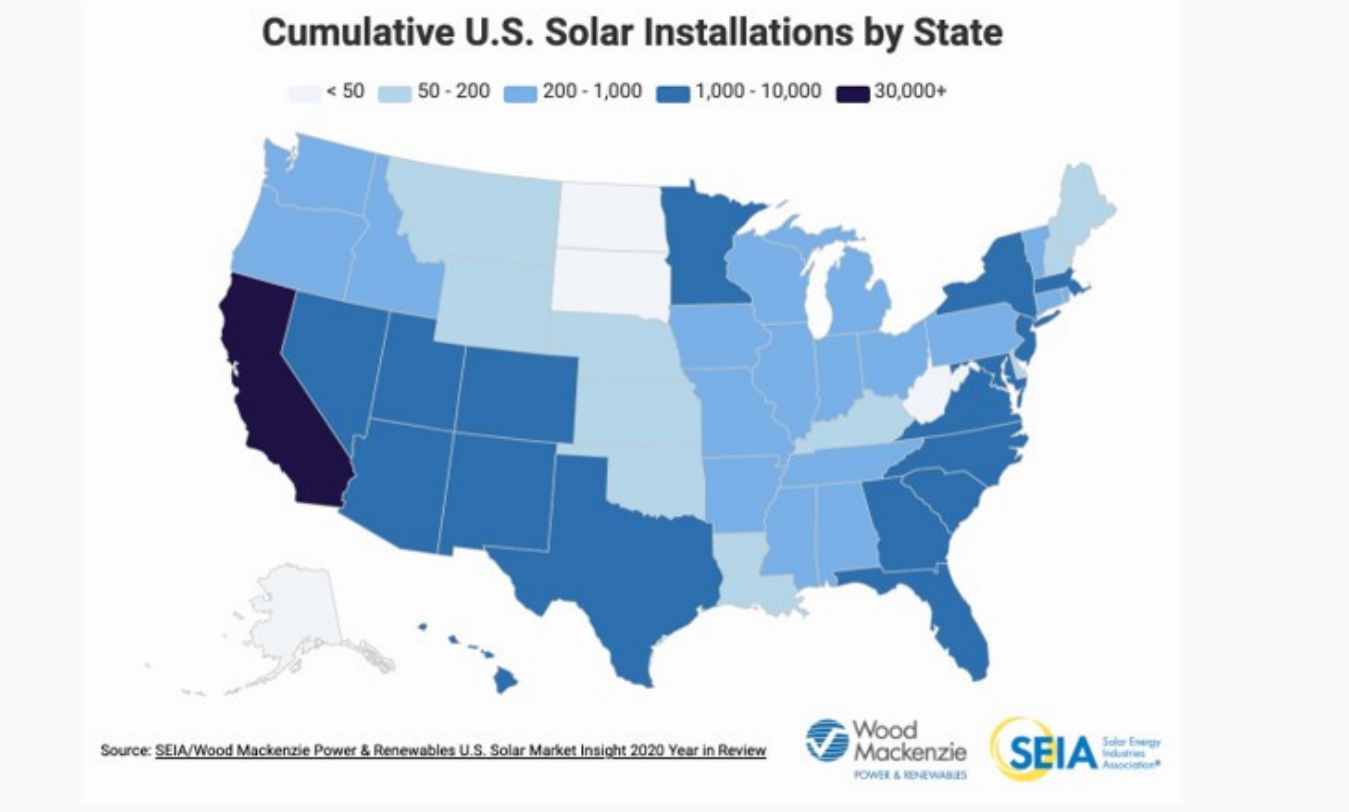
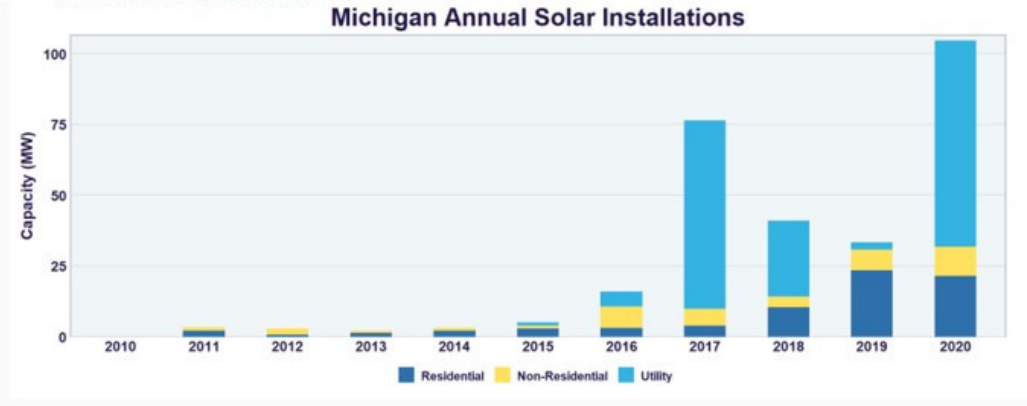
Appendix B: Solar Energy Progress in Each State

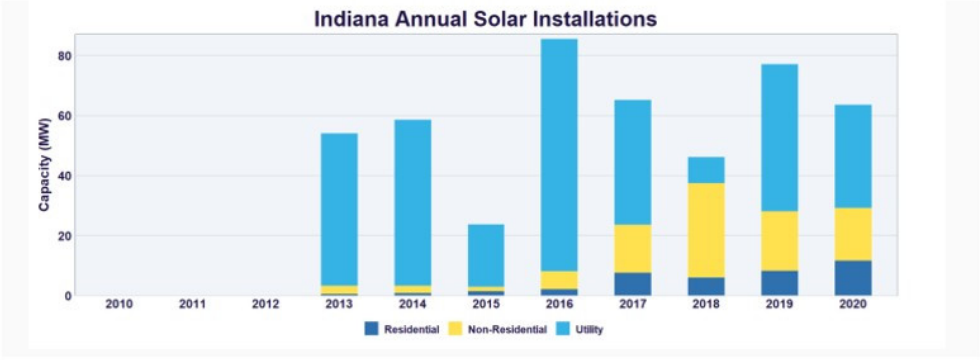
Materiality for Solar Implementation by State					
State	Installed (MW)	Total Investment	National Ranking	Projected Growth (MW)	Statewide RPS (Y/N)
OH	503.3	$953M	23rd	2,349	N
IL	465.4	$1.1B	26th	2,625	Y
IN	473.3	$735M	24th	3,969	N
MI	290.7	$502M	34th	1,594	Y
MN	1,568.6	$2.2B	15th	1,138	Y
PA	664.34	$2.1M	21st	1,108	Y
TN	356.1	$667M	31st	2,038	N

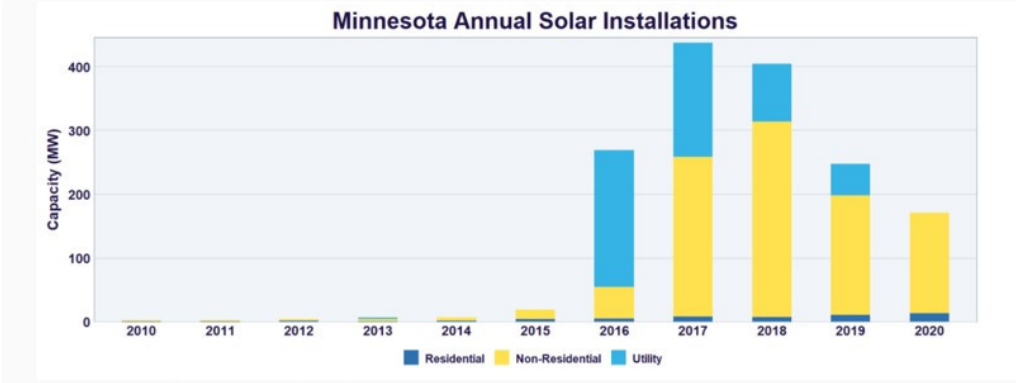


Appendix B: Solar Energy Progress in Each State

View more solar data







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